Prevention of cervical cancer in rural China: evaluation of HPV vaccination and primary HPV screening strategies

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
This study evaluated the cost-effectiveness of vaccination against human papillomavirus, as an alternative or an addition to screening, in rural China. The authors concluded that the greatest health gains were achieved by vaccination plus at least two screening sessions. A vaccine dose cost of less than nine to 14 US dollars was required for vaccination to be cost-effective. The methods were satisfactory, but some were poorly reported. The authors’ conclusions appear to be appropriate, but there were some limitations.

Type of economic evaluation
Cost-effectiveness analysis

Study objective
The objective was to evaluate the cost-effectiveness of vaccination against human papillomavirus (HPV) infection, as an alternative or an addition to primary care HPV screening, in rural China.

Interventions
Screening once at 35 years of age, screening at ages 30 and 45 years, and five-yearly screening from the age of 30 to 59 years were considered alone or with vaccination of 15-year-old girls. These were compared with vaccination alone.

Location/setting
China/primary care.

Methods
Analytical approach:
Published models were adapted to the rural Chinese setting to produce a dynamic model of sexual behaviour and HPV transmission, linked with a cohort model of the natural history of disease. These combined published data to determine the clinical and economic impact of the screening and vaccination programmes. The time horizon was lifetime and the authors stated that a societal perspective was adopted.

Effectiveness data:
The effectiveness data came from published sources that included observational studies in the rural Shanxi Province, for parameters such as cancer mortality. The key clinical parameters were the incidence of cervical cancer, mortality, and the effectiveness of screening.

Monetary benefit and utility valuations:
Not relevant.

Measure of benefit:
The measure of benefit was the number of life-years saved, which were discounted at a rate of 3% per year from the age of 10 years.

Cost data:
The analysis included the direct costs of screening, diagnosis, and treatment for pre-cancer disease, and the treatment of cervical cancer. The costs of pre-cancer screening, diagnosis, and treatment were from a published micro-costing study.
Those of cancer treatment were from an audit of hospital charges for 192 patients in three hospitals in Shanxi Province. The HPV vaccine delivery costs were not available for the study setting, so threshold values, at which vaccination would be cost-effective, were derived. The costs were discounted at a rate of 3% per year. They were calculated in Chinese yuan and converted to US dollars ($).

Analysis of uncertainty:
One-way sensitivity analyses were performed on the key model parameters. A probabilistic sensitivity analysis was performed.

Results
The estimated number of premature deaths averted over the lifetime of 100,000 women, ranged from 93 with screening once to 726 with five-yearly screening plus vaccination.

At a cost per vaccinated girl of $50 to $54 or lower, the strategies including vaccination were cost-effective. Vaccination plus screening once or twice were both cost-effective at a cost per girl of $52. At costs greater than $54 per girl, screening-only strategies were cost-effective. Vaccination plus five-yearly screening was not cost-effective, even at low costs per vaccinated girl.

The one-way sensitivity analysis showed that the results were sensitive to the cost and sensitivity of HPV testing, as well as the duration and degree of vaccination protection. The probabilistic sensitivity analysis found that the results were relatively robust to variations in the coverage assumptions.

Authors' conclusions
The authors concluded that the greatest health gains were achieved by vaccination plus at least two screening sessions in rural China. A vaccine cost of less than $9 to $14 per dose was required for vaccination to be cost-effective.

CRD commentary
Interventions:
The interventions were described and appear to have been appropriate comparators. Several combinations of plausible HPV screening and vaccination strategies were compared with no screening. These strategies are likely to be relevant in other settings.

Effectiveness/benefits:
The use of local data for the effectiveness estimates was appropriate for the setting. The method used to identify the sources of effectiveness data was not described, so it is unclear whether the best available evidence was used. The measure of benefit appears to have been appropriate, but quality-adjusted life-years would have been useful, as they capture morbidity as well as mortality.

Costs:
The perspective was described as societal, but only the direct costs appear to have been included. Costs, such as productivity losses, are usually included for a societal perspective. The micro-costing study of pre-cancer screening, diagnosis, and treatment was not described, leaving it unclear if the setting was relevant. The authors did not explicitly state the price year and it was unclear if the costs were appropriately adjusted for inflation. Other details, such as the discount rate, were provided.

Analysis and results:
The analytic approach was satisfactorily reported and the model structure was briefly reported in an appendix. The cost, life-year, and cost-effectiveness results were reported in a graph. Appropriate sensitivity analyses were performed.

Concluding remarks:
The methods were satisfactory, but some were poorly reported. The results were sufficiently reported. The authors' conclusions appear to be appropriate, but the limitations should be considered.
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